REMARKS

Claims 1-31 and 75-100 are pending. Claims 1, 5, 10, 13, 14, 16, 24, 27, 29, 87 and 89 are amended. Claim 31 is canceled. Claim 101 is added. Claims 13 and 27 have been amended to comprise specified unit operations. Claim 16 has been amended to specifically recite the ortho construction for the second flow path. Support for the amendment to claim 10 can be found at Figure 4 and the accompanying descriptions in the first seven paragraphs in the Description of the Preferred Embodiments. The specification and claims are amended to correct an obvious error in the discussion of the phrase "substantially parallel to sheet (or shim) thickness." The person skilled in the art, reading the specification, will immediately recognize this error in view of the discussion of the first shim style on pages 1-2 versus the "ortho" style, and the descriptions and illustrations of the invention throughout the specification.

Claim Objections

Claim 10 has been amended to remove the redundancy by replacing "first" with "second." This was the intended change and claim 16 contains a narrower version of this embodiment.

In claims 24 and 26, the objectionable term "·m" was an artifact of electronic file transfer. Each of the claims remained with the claim indentifier "original." Therefore, the claims are now maintained as original with the original units "μm".

Improper Finality

The "after final" status of the application is improper because the new rejections were not necessitated by an amendment to the claims. Claim 13 was essentially unamended since it essentially incorporated the limitations of claim 14; in other words, claim 13 (in the amendment of April 17, 2007) was essentially the same as claim 14 of the prior claim set.

Furthermore, unamended claims 75, 78 and 79 (in the amendment of April 17, 2007) have been rejected in view of a newly applied reference (Bottcher). The rejection of these claims was not necessitated by any amendments.

Rejection as Anticipated by Bottcher et al.

Claims 13-17, 21, 76, 85, 87-90, 92, 93, 96, 99, and 100 have been rejected under 35 USC §102(b) as anticipated by Bottcher et al. US 5,657,818.

Claim 13 is now amended to incorporate all the limitations of claim 14, specifically, that the unit operation comprises chemical separation or distillation. Bottcher et al., at col. 2, lines 49-54 does not teach or suggest either of these unit operations.

Claim 87 recites a process in which "the flow path in at least one of the shims further comprises a section in which the flow path extends in a direction substantially perpendicular to shim thickness." Thus, the claimed process utilizes a semi-ortho design in which flow in a flow path runs perpendicular to thickness and parallel to thickness. This is not taught or suggested by Bottcher et al. In Bottcher, flow is either all substantially parallel (channels 1, see col. 1, lines 60-62) or substantially parallel (flow spaces 4).

Accordingly, withdrawal of this rejection is respectfully requested.

Rejection as Anticipated by Symonds

Claim 10 has been rejected under 35 USC §102(a) as anticipated by Symonds WO 01/35043.

Amended claim 10 recites first, second and third flow paths that are in alternating parallel rows. This configuration is shown Fig. 4 and the accompanying descriptions of figure 4 in the specification. This configuration provides advantages over the Symonds design in efficiency and scalability. The Symonds design is very different and it would not have been obvious to modify Symonds to obtain the design of amended claim 10.

Accordingly, withdrawal of this rejection is respectfully requested.

Rejection as Obvious Over Bottcher et al. ('818) in view of Yamashita et al.

Claims 1-3, 6-9, 75, 78, 79, 86, and 95 have been rejected under 35 USC §103(a) as obvious over Bottcher et al. ('818) in view of Yamashita et al.

In Bottcher, heat exchange is enhanced by turbulent flow in the cross-flow channels 4. Thus, the person skilled in the art would not be motivated to modify Bottcher's devices by incorporating the features of Yamashita. Additionally, claim 1, as now amended, recites a second flow path parallel to sheet thickness; this feature is not taught or suggested by Bottcher or the combination of Bottcher and Yamashita.

Claim 75 is additionally patentable because it recites that the shape of the aperture comprises waves or irregular shapes. This is not a mere arbitrary shape change; it provides an

advantage that is not recognized in the prior art. Specifically, the wavy (see Fig. 4c) or irregular apertures create a boundary layer separation and improve heat transfer.

Rejection as Obvious Over Bottcher et al. ('818) in view of Yamashita et al. and further in view of Bottcher et al. (US 5,212,004)

Claim 4 has been rejected under 35 USC §103(a) as obvious over Bottcher et al. ('818) in view of Yamashita et al. and further in view of Bottcher et al. (US 5,212,004).

This rejection is traversed for the reasons discussed above. Additionally, there is not a proper motivation for combining the design of the '004 patent with the design of the '818 patent.

Rejection as Obvious Over Symonds in view of Yamashita et al.

Claims 11 and 12 have been rejected under 35 USC §103(a) as obvious over Symonds (WO 01/35043) in view of Yamashita et al.

This rejection is traversed for the reasons discussed above with reference to claim 10.

Rejection as Obvious Over Bottcher et al. ('818) in view of Bottcher et al. ('004)

Claims 18-20 and 22 have been rejected under 35 USC §103(a) as obvious over Bottcher et al. ('818) in view of Bottcher et al. (US 5,212,004).

This rejection is traversed for the reasons discussed above for claim 13. Additionally, all of these claims depend from claim 16, and claim 16 is now amended to recite adjacent "ortho"

style channels comprising a second fluid. Bottcher does not teach or suggest this feature since Bottcher is cross-flow.

Rejection as Obvious Over Bottcher et al. ('818)

Claim 23 has been rejected under 35 USC §103(a) as obvious over Bottcher et al. ('818). Claim 23 depends from claim 16 and is nonobvious for the same reasons.

Rejection as Obvious Over Bottcher et al. ('818) in view of Haswell et al.

Claims 24-26, 77 and 97 have been rejected under 35 USC §103(a) as obvious over Bottcher et al. ('818) in view of Haswell et al. This rejection is respectfully traversed.

As explained in Applicants' specification, the invention represents a radical departure from previously presented configuration for microchannel technology. Prior microchannel devices (such as those of Haswell) were oriented such that the microchannels ran along the length of the shim (or plate). Microchannels devices having the conventional orientation could be made by etching microchannels into a plate or wafer. This was well developed technology from the electronics industry. Alternatively, channels could be made by stamping; in this fashion, the channel height would be defined by the thickness of the shim from which the microchannels were stamped. No one had thought to make process microchannels in the direction parallel to shim thickness. Furthermore, no one had recognized any advantage from this orientation, for example, no one had recognized any advantage for constraining high interstream pressure differentials within microchannels using this configuration.

The invention of claim 24 is not obvious over the prior art because the prior art does not provide a motivation to construct microchannel devices in the "ortho" direction; nor does the prior art provide an enabling teaching for microchannels constructed in this fashion. "The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable expectation of success, viewed in light of the prior art." *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988), cited in MPEP 2144.08. In this case, the prior art does not suggest the desirability of microchannel devices constructed in the "ortho" direction, nor does it provide an enabling description for ways to construct such devices. Accordingly, the invention of claim 24 is not prima facie obvious over the cited references.

Even if the claimed invention were *prima facie* obvious, the surprising and superior results for operation at high pressure would establish the nonbviousness of the claimed invention.

Furthermore, the Bottcher reference is not appropriate for an obviousness-type rejection because it is non-analogous art. Microchannel devices have special advantages and challenges that set them apart from conventionally sized devices. Microchannel processing is a subspecialty for chemical engineers. The skilled worker would study the microchannel art for ideas for designing a microchannel device. The skilled worker would not look to conventional designs since both the manufacture and expected performance would be expected to be radically different. Therefore, the Bottcher reference is not analogous art and cannot be considered in a section 103 rejection. See MPEP 2141.01

Accordingly, withdrawal of this rejection is respectfully requested.

Rejection as Obvious Over Symonds in view of McCausland

Claims 27-29 and 84 have been rejected under 35 USC §103(a) as obvious over Symonds in view of McCausland.

Claim 27 is now amended to specify that the unit operation comprises adsorbing, absorbing, or separating. None of these unit operations is taught or suggested in the cited references.

Accordingly, withdrawal of this rejection is respectfully requested.

Rejection as Obvious Over Symonds in view of McCausland and further in view of Gaiser

Claims 82 and 83 have been rejected under 35 USC §103(a) as obvious over Symonds in view of McCausland and further in view of Gaiser.

Gaiser does not teach or suggest the unit operations of amended claim 27. Thus, these claims are patentable for the reasons stated above.

Rejection as Obvious Over Bottcher et al. ('818) in view of Symonds

Claim 91 has been rejected under 35 USC §103(a) as obvious over Bottcher et al. ('818) in view of Symonds.

As discussed above with relation to claim 87, neither of the cited references describe a semi-ortho design. Accordingly, claim 91 is nonbobvious over the Bottcher and Symonds references.

Conclusion

If the Examiner has any questions or would like to speak to Applicants' representative, the Examiner is encouraged to call Applicants' attorney at the number provided below.

Respectfully submitted,

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